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Hazardous Waste Management System: General Standards Applicable to Owners and Operators of Hazardous Waste Treatment, Storage, and Disposal Facilities; and Hazardous Waste Permit Program

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HAZARDOUS WASTE MANAGEMENT SYSTEM: GENERAL; STANDARDS APPLICABLE TO OWNERS AND OPERATORS OF HAZARDOUS WASTE TREATMENT, STORAGE, AND DISPOSAL FACILITIES; AND HAZARDOUS WASTE PERMIT PROGRAM (40 CFR 260, 264, and 122)

Permitting of Land Disposal Facilities: Performance Standards for Land Disposal Facilities

This document (ms. 1941.42) provides background information on EPA's proposed regulations for land disposal of hazardous waste

U.S. ENVIRONMENTAL PROTECTION AGENCY
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INTRODUCTION

This background document covers two subjects; proposed standards applicable to all land disposal facilities under Subpart B - General Facility Standards, and proposed standards applicable to land disposal facilities handling specific wastes or waste types under Subpart T - Minimum Acceptable Treatment of Hazardous Wastes Prior to Disposal.

The requirements proposed in Subpart B - General Facility Standards are amendments to the existing regulations applicable to all treatment, storage, and disposal facilties promulgated on 19 May 1980 and 12 January 1981. The amendments either broaden the applicabililty of existing regulations to cover land disposal facilities or add general facility standards specifically applicable to land disposal facilities. Many of the requirements are closely related to the ground-water protection standard covered in Background Document No. 7, and define the means of showing compliance with the standard. Others embody the minimum standards which apply, the demonstrations which are required, and the factors to be considered in the demonstrations and in the permit issuance process when a variance from the ground-water protection standard is required. Additional requirements apply to the demonstrations and factors to be considered with respect to effects on surface waters, the atmosphere, land areas, and structures.

The requirements proposed in Subpart T - Minimum Treatment of Hazardous Waste Prior to Disposal represent a minimum first generation of standards which are applicable to specific wastes or specific waste streams. There are types of wastes for which the

agency expects to be able to promulgate requirements for disposal which will obligate the owners and operators of land disposal facilities to process the waste in a specific way (i.e., employ a known available technology or its equivalent in terms of performance) prior to disposal to minimize the risk of adverse human health or environmental effects or to avoid the undesirable or unnecessary wasting of resources. The specific minimum requirements of the proposed regulations are not fully representative of the future scope of this subpart envisioned by the agency. Work toward developing additional appropiate requirements to be proposed within this subpart is underway by the agency. It is expected that by considering specific wastes or waste streams individually, the agency can in the future make major improvements in the regulation of hazardous wastes. The concept of this subpart is similar to a "class of hazard" system in effect, but the approach is to deal with definable specific wastes and waste streams as discrete units rather than attempting to broadly categorize all listed wastes into subgroups.

I. NEED FOR REGULATION (General Facility Standards)

The need for the regulations proposed in this subpart is related primarily to the need to provide definitive means of demonstrating and judging the acceptability of existing and proposed land disposal facilities. The regulations cover the demonstations required to establish that the ground-water protection standard in §264.2 will be met; and the demonstrations, minimum standards, and performance requirements which apply when the ground-water protection standard cannot be met and a variance from the standard

is required. It also covers the demonstration requirements and and performance standards related to other than ground water (i.e., surface waters, the atmosphere, land areas, and structures).

II. ANALYSIS OF STANDARDS (General Facility Standards)

1. Location - §264.10

A. Proposed Regulation and Rationale

See the background document "General Facility Standards for Location of Facilities" dated 30 December 1980.

B. Summary of Comments

See 30 December 1980 Background Document

C. Discussion

This amendment simply establishes the applicability of the location requirements for hazardous waste treatment, storage, and disposal facilities promulgated in §264.18 on 12 January 1981 to land disposal facilities.

D. Regulatory Language

In §264.10, paragraph (b) is revised to read as follows:

§264.10 Applicability.

(b) Section 264.18(b) is applicable only to facilities subject to regulation under Part 264, Subparts I, J, K, L, M, N, O, R, S, and T.

2. Land disposal facilities - §264.19

ISSUE: Types of facilities listed - §264.19(a)

A. Proposed Regulation and Rationale

N/A

B. Summary of Comments

N/A

C. Discussion

See the Preamble at 46 FR 11136-38 for a comprehensive discussion of the issues related to the listing of facilities which are considered land disposal facilities and therefore subject to the generic requirements of the reproposed regulations. The following supplements that discussion with respect to surface impoundments and waste piles.

In the preamble discussion, it was pointed out the when surface impoundments and waste piles are designed to preclude discharge, they are considered to be used "solely for storage or storage and treatment" and therefore they are not considered land disposal facilities. As noted above, facilities which are not considered and listed as land disposal facilities are not subject to the generic requirements of these proposed regulations. The generic land disposal regulations also include Subpart F - Ground-water and Air Emission Monitoring.

It is clear by reference to the amendments to Subpart K - Surface Impoundments in §§264.220, 264.221, and 264.228 and the amendments to Subpart L - Waste Piles in §§264.250, 264.251, 264.252, 264.254, and 264.258 (See Background Documents No. 1 & 2) that the only surface impoundments and waste piles which are used "solely for storage or storage and treatment" are those which comply with the requirements of Subparts K & L promulgated as interim final rules on 12 January 1981. Those regulations mandate certain specific design and operating requirements which are optional for surface impoundments and waste piles which are considered land disposal facilities.

With respect to surface impoundments, the regulations require that a facility which is "used solely for storage or storage and treatment" be designed and constructed with a double liner and a leachate detection, collection, and removal system; and furthur that wastes and waste residues be removed at closure. Similar facility integrity is to be provided for waste piles "used solely for storage or storage and treatment" by either a leachate detection, collection and removal system or by an impermeable base which is frequently cleaned to expose the base for inspection.

Therefore, an owner or operator who seeks a permit for a surface impoundment or waste pile which, although it is designed and constructed with the objective of preventing any leakage into the land, does not comply with the requirements of the interim final regulations promulgated on 12 January 1981 (e.g., a surface impoundment designed and constructed with a single liner and without a leachate detection, collection, and removal system or a waste pile designed and constructed with a base which cannot be frequently inspected or without a leachate detection, collection, and removal system) is considered a land disposal facility.

The owner or operator of such a facility must monitor the ground water, and comply with all of the requirements of the generic land disposal regulations. If preventing any discharge into the land is a stated design objective which is reflected as a permit condition, any leakage would be a permit violation requiring corrective action on the part of the owner or operator of the facility. In order to show that corrective action would be effective, the migratory route that any leakage would follow would

have to be determined or predicted. If corrective action could not be expected to result in the recovery of all waste or waste residue which leaked from the facility, the owner or operator must seek authorization for the leakage that might occur and show that such leakage will not interfere with the subsequent use of the ground water, surface waters, land, or structures that would be affected by such a discharge. Of course, the practicality of making a sucessful showing that corrective action would be fully effective would depend on the depth of the uppermost aquifer.

D. Regulatory Language

Section 264.19 is added to read as follows:

§264.19 Land disposal facilities.

(a) Several types of facilities at which hazardous waste is intentionally placed, discharged, deposited, or injected into or on the land; at which waste may remain after closure; and from which leachate may discharge into or on any land are defined in §260.10. These facilities include the following types;

(1) Surface impoundments other than those used solely for storage or storage and treatment,

(2) Waste piles other than those used solely for storage or storage and treatment,

(3) Land treatment facilities,

(4) Landfills,

(5) Underground injection facilities,

(6) Seepage facilities; including seepage lagoons, drying beds, seepage pits, seepage beds, and injection wells that are not cased to prevent discharge into the surficial aquifer.

ISSUE: Other types of facilities - §264.19(b)

A. Proposed Regulation and Rationale

N/A

B. Summary of Comments

N/A

C. Discussion

See the Preamble at 46 FR 11136 and 46 FR 11150-51

D. Regulatory Language

(b) No disposal of hazardous wastes into or on the land will be authorized by permit except in a facility listed in subsection (a) of this section unless the specific type of land disposal facility is approved by rulemaking petition in accordance with §§260.20 and 260.23.

ISSUE: Classes of land disposal facilities - §264.19(c)

A. Proposed Regulation and Rationale

N/A

B. Summary of Comments

N/A

C. Discussion

See the Preamble at 46 FR 11138

D. Regulatory Language

(c) For the purpose facilitating descriptions of the varying amounts of information required to pursue a permit under §§264.2(a)(1) or (2) and to establish compliance with performance standards, monitoring and modeling requirements, and technical standards; and to facilitate descriptions of varying performance standards, monitoring and modeling requirements, and technical

standards in these regulations; the following classes of land disposal facilities are established:

(1) Class A: a land disposal facility which does or will discharge into an aquifer which, in its entirety, is not and will not in the future be a source of water supply for any use.

(2) Class B: a land disposal facility which does or will discharge into a portion of an aquifer which is not and will not in the future be a source of water supply for any use although other portions of the same aquifer is or may in the future be a source of water supply for some use.

(3) Class C: a land disposal facility which does or will discharge into a portion of an aquifer which is or may in the future be a source of water supply for uses other than as drinking water.

(4) Class D: a land disposal facility which does or will discharge into a portion of an aquifer which is or may in the future be a source of public drinking water supply.

(5) Class E: a land disposal facility which does or will discharge into a portion of an aquifer which is or may in the future be a source of private drinking water supply.

3. Minimum standards applicable to a variance from the ground-water protection standard for ground water used for drinking - §264.20

The numerical limits proposed in §264.20 are minimum requirements for permitting land disposal facilities which require a variance because they do or would discharge to ground water that is now or may in the future be used as a source of drinking water.

The standards should ensure that ground water affected by discharge will be acceptable for subsequent drinking water use, at least with respect to the listed contaminants.

The numerical standards in §264.20(a) are based on the National Drinking Water Regulations. The National Drinking Water Regulations, both interim primary and secondary, establish limits as maximum concentration levels of metals and inorganics indigenous to ground water, several pesticides, and bacteria; above which ground water is not considered properly usable as drinking water. The proposed standards in §264.20(a) are usually expressed as percentages of the limits established in the drinking water regulations.

Also of significance are the contaminants, not listed in the National Drinking Water Regulations, which are likely to be found in discharges of liquid hazardous wastes and leachate. Many of these contaminants (especially hazardous constituents) if present in a discharge, would make the ground water unusable for drinking. Some of these potential contaminants are listed in §264.20(b).

The contaminants listed in §264.20(b), which includes the pesticides listed in the National Primary Drinking Water Regulations, cannot be safely discharged to drinking water. They are generally known or suspected carcinogens, highly toxic, or are produced and marketed as systemic poisons. Use and spillage account for the primary human and environmental exposure. The requirements, which are minimum standards, do not preclude discharge of these substances to the ground water, but do restrict the intentional disposal of such substances to ground water used or not precluded from use as human drinking water.

ISSUE: Minimum standards based on the National Primary and National Secondary Drinking Water Regulations - §264.20(a)

A. Proposed Regulations and Rationale

The "Human health and environmental standard (Ground-water endangerment standard)" proposed on 18 December 1978 included numerical standards, based on the National Interim Primary Drinking Water Regulation, for ground water affected by discharges from hazardous waste land disposal facilities. In addition, the Agency indicated its intention to rely on "Specific ambient health and environmental performance standards" in the 8 October 1980 Supplemental Notice of Proposed Rulemaking. Both of these proposals are discussed under "issue headings" in Background Document No. 7.

B. Summary of Comments

See Background Document No. 7

C. Discussion

The reproposed regulations for hazardous waste land disposal facilities include some specific ambient health and environmental performance standards in §264.20(a). The specific standards proposed are based, in part, on the numerical standards adopted by the Agency as National Interim Primary and National Secondary Drinking Water Regulations. The standards proposed are applicable only to owners and operators of Class D and E land disposal facilities as defined in §264.19(c), i.e., land disposal facilities which do or will discharge into a portion of an aquifer which is or will in the future be a source of public or private drinking water supply.

The National [Interim] Primary Drinking Water Regulations (NIPDWR or NPDWR), published on 24 December 1975 at 40 FR 59566,

establish maximum contaminant levels (MCL's) for certain contaminants that are commonly found in drinking water which are of direct significance to health of consumers of the water. Amendments to the NPDWR were proposed on 19 July 1979 at 44 FR 42246. The National Secondary Drinking Water Regulations (NSDWR) were proposed on 31 March 1977 at 42 FR 17143 and promulgated on 19 July 1979 at 44 FR 42196. In contrast to the enforceable character of the NPDWR, the NSDWR recommend maximum contaminant levels for certain comtaminants commonly found in drinking water that are associated primarily with the asthetic qualities of drinking water.

The regulations proposed for §264.20(a) are based primarily on background work done in support of the NPDWR and the NSDWR rather than on the regulations themselves. The exception to this is the 80% factor suggested as a factor to be applied to the numerical criteria adopted in the NPDWR for selected contaminants in §264.20(a)(1). Comment on the application of this factor was invited in the preamble to the reproposed regulations at 46 FR 11138. The 80% factor was described in the preamble as a "margin for error" to avoid "brinkmanship" in the permitting process. Comment was specifically requested on the reasonableness of using such a factor rather than the standard itself. The NPDWR requires (in §141.32), for a community system, that the supplier of water notify persons served by the system of failure to comply with the numerical limits of the NPDWR. Such notice must be included with the water bills, made by newspaper notice, and made by making a copy of the notice of failure available to radio and television stations in the area served by the system. The cost and trauma which could be associated

with such notices could be significant, especially if the failure were associated with the permitted discharge of those contaminants from a hazardous waste land disposal facility. Therefore the 80% factor is intended as a possible means to avoid the potential of such an occurance. The inorganic chemical sampling and analytical requirements of the NPDWR in §141.23 require ground water sources used by community systems to be sampled and analyzed once every three years. If a NPDWR standard is exceeded, the requlation requires that the sampling and analysis be repeated three additional times within one month (except for nitrate which is more stringent). Then, if the excursion of the contaminant concentration beyond the specified limit is confirmed by an average of the results, the notifications noted above are required.

The numerical standards in §264.20(a) apply at any point of actual or potential collection or withdrawal of ground water for use as drinking water, and only apply directly when the concentration of contaminants which is or which will exceed the standards is caused by a discharge. Therefore, the numerical standards will not apply directly to a discharge except in the circumstance when the background quality of the ground water (natural or caused by other discharges or land use) already exceeds the standards and the dilution effects of the indigenous ground water are not available. In such cases, if the background quality was natural, the discharge could not cause the standard to be exceeded even if the discharge concentration exceeded the standard by an amount equal to the background concentration. If, however, the concentration was caused by other discharges or due to land use,

such flexibility might not be available unless the causal factors were not subject to practical corrective action.

Some examples may ensure that the above is clearly understood. Using barium, suppose that the natural background concentration in the ground water was 0.5 mg/l. Barium solubilized by leachate which raised the concentration of barium in the ground water to 0.7 mg/l would be considered an acceptable effect. However, if the concentration in the ground water were raised to 0.9 mg/l, the effect could only be acceptable if it were reduced by to 0.8mg/l (the standard for barium) or below before it reached a point of withdrawal for use. Such a reduction might be demonstrated to occur due to dilution, or due to attenuation provided it could be furthur shown that the capacity for barium attenuation would not be exceeded and that the subsequent release of barium due to the potential reverseability of the reaction which resulted in the attenuation would not result in concentrations of barium above 0.8 mg/l at a later time. Now consider a background concentration of barium of 1.2 mg/l in the ground water. Ignoring potential attenuation, any discharge with a barium concentration of greater than 1.2 mg/l would cause the concentration of barium in the ground water to increase. However, discharges with concentrations of barium at or below 1.2 mg/l would not cause the concentration in the ground water to increase and would be acceptable. If the barium concentration of 1.2 mg/l represented background but resulted from another discharge, a special case would exist, and the elevated background would have to be ignored. In such a case, no discharge with a barium concentration greater than natural background (or the

0.8 mg/l standard, whichever is greater) could be permitted unless the elevated concentration could not be reduced through control.

Not all of the contaminants that are listed in the NPDWR are listed in §264.20(a)(1). Of the inorganic contaminants indigenous to ground water, only six of the ten contaminants covered by the NPDWR are listed. Mercury was omitted in error, and is added to the listing in the regulatory language. Arsenic was intentionally omitted since it is covered in §264.20(b); and silver and floride were omitted since the rationale behind the inclusion of concentation limits for those elements in the NPDWR are related to the addition of those contaminants in water supply treatment systems.

The rationale for the concentration of barium proposed is based on the Statement of Basis and Purpose used to support the standard in the NPDWR (1). The proposed standard is 1.0 mg/l; and it would be applied at 80% of that value or 0.8 mg/l. As explained above, the 80% factor is an administrative proposal that a factor be applied to the standards established in the NPDWR. In the following discussions and statements concerning limits proposed in §264.20(a)(1) based on limits established in the NPDWR the application of that factor will be ignored.

The proposed standard for cadmium is 0.010 mg/l (2).

The proposed standard for total chromium is 0.05 mg/l (3).

The proposed standard for lead is 0.05 mg/l (4).

The proposed standard for mercury is 0.002 mg/l (5). The proposed standard for mercury was omitted in the printed regulation.

The proposed standard for nitrate (as N) is 10 mg.l (6).

The proposed standard for selenium is 0.01 mg/l (7).

The organic chemicals for which standards are established in the NPDWR are covered in §264.20(b) rather than in §264.20(a); and no standards are proposed to cover microbiological contaminants or radioactivity for which standards are established in the NPDWR.

Maximum levels are proposed in §264.20(a)(2),(3),(4), and (5) for all but two of the contaminants which are covered in the NSDWR. The two which are excluded are corrisivity and pH. A maximum contaminant level is proposed for sodium in §264.20(a)(6). The proposed standards are applicable to points of actual or potential use when the contaminants are caused by a discharge in the same manner as described for contaminants listed in §264.20(a)(1).

The maximum levels proposed in §264.20(a)(2),(3),(4), and (5) are based on the data presented in the Statement of Basis and Purpose (8) used to support the proposed NSDWR promulgated on 31 March 1977 at 42 FR 17143. The Statement of Basis and Purpose included an Introduction which explained the document. That Introduction is reproduced below as follows:

"The regulations have been predicated on the best and latest information available at the time of their promulgation. The concepts and rationale included in this Statement of Basis and Purpose were used in arriving at specific recommendations and should enable those whose responsibility it is to interpret or apply the regulations to do so with understanding, judgement, and discretion.

The maximum contaminant levels should not be exceeded when more suitable supplies can be made available. The limits are based on factors that render a supply less desirable for use. These considerations relate to materials that impart objectionable taste

or odor to water, or render it economically or esthetically inferior. Experience has shown that under such circumstances, many people turn to alternative non-public supplies which may be less safe.

For each contaminant, wherever possible, the discussion includes an optimum quality level and the considerations of levels higher than the maximum recommended. The optimum quality level should be viewed as a goal in providing esthetically pleasing drinking water."

The above discussion is central to the standards proposed in the land disposal regulations since, as noted in the preamble, the levels proposed are established as percentages of the standards established in the NSDWR and are intended to maintain "optimum" water quality for drinking (where that quality exists) rather than allowing degradation to the maximum acceptable contaminant levels for use as represented by the NSDWR. It should be understood that the maximum levels adopted in the drinking water regulations are standards intended for use in rejecting a supply as unsuitable. The standards do not represent <u>good</u> water quality, but rather water quality that is not sufficently <u>bad</u> to warrant rejection of the supply. The standards therefore represent the upper limit of a range of water quality which is considered acceptable for use as drinking water. The upper limit, i.e., the adopted NSDWR levels, are the worst quality water within the range which is considered usable. The difference between "optimum" water quality, i.e., the best water quality within the range, and the NSDWR limit is real and noticable and would represent a significant deterioration in the quality of the water if water which met the "optimum" levels were allowed to be degraded to the NSDWR limits.

The permitting of discharges which will affect drinking water should not result in an "adverse effect"; and allowing a discharge to affect a water supply which meets the quality defined as "optimum" to the extent that it would barely meet the levels established in the NSDWR would be an adverse effect. One commenter on the 18 December 1978 proposal seemed to take note of this characteristic of the drinking water regulations by commenting that allowing degradation of ground water up to the NIPDWR levels is contrary to environmental protection policy; although the point is not as applicable to the NIPDWR as it is to the NSDWR.

The proposed standard for chloride is 100 mg/l; i.e., 40% of the NSDWR limit of 250 mg/l (9).

The proposed standard for foaming agents is 0.2 mg/l; i.e., 40% of the NSDWR limit of 0.5 mg/l (10).

The proposed standard for sulfate is 100 mg/l; i.e., 40% of the NSDWR limit of 250 mg/l (11).

The proposed standard for total dissolved solids (TDS) is 200 mg/l; i.e., 40% of the NSDWR limit of 500 mg/l (12).

The proposed standard for copper is 0.2 mg/l; i.e., 20% of the NSDWR limit of 1.0 mg/l (13).

The proposed standard for iron is 0.06 mg/l; i.e., 20% of the NSDWR limit of 0.3 mg/l. The optimum level listed in the reference is 0.05 mg/l which would represent 16.7% of the NSDWR limit (14). The level of 0.06 mg/l was chosen for simplicity in stating the proposed standard as a percentage of the NSDWR limit and since the measurable difference between 0.06 mg/l and 0.05 mg/l is not significant.

The proposed standard for manganese is 0.01 mg/l; i.e., 20% of the NSDWR limit of 0.05 mg/l (15).

The proposed standard for zinc is 1.0 mg/l; i.e., 20% of the NSDWR limit of 5.0 mg/l (16). The value of 0.2 mg/l shown in the proposed regulation as printed is an error of transcription.

The proposed standard for color is 3 color units which is 20% of the NSDWR limit of 15 color units (17).

The proposed standard for odor is a threshold odor number (TON) of 1. The NSDWR limit is a threshold odor number (TON) of 3 (18).

The proposed standard for sodium is 20 mg/l. Although no limit was set in either the NPDWR or the NSDWR, the validity of a standard of 20 mg/l for sodium is widely recognized as an appropiate standard for persons subject to a restricted sodium diet (19). The National Academy of Sciences has reported data that indicate 15 to 20% of the Caucasian adult population (and a higher percentage of blacks) is at risk of developing hypertension due to sodium intake, and that about 3% of the population is on restricted sodium diets (20). On 19 July 1979, the Agency proposed amendments to the NPDWR which would require suppliers of water for community water systems to analyze water samples for sodium content annually and report the results to consummers and local public health officials. Therefore the Agency considers it appropiate to ensure that discharges from land disposal facilities that will affect drinking water sources be controlled to the 20 mg/l goal for sodium in drinking water which is recommended by the Agency (See 44 FR 42250) for public drinking water systems.

It is recognized that many of the contaminants listed in §264.20(a) can be controlled by treatment, especially in public water supply systems. However, the addition of treatment is a cost which, in the view of the Agency, should not be caused by the permitted discharges from land disposal facilities. In some cases, the treatment provided to control one contaminant can introduce other contaminants into the system (19, 20).

It is also recognized that the contaminants for which standards are proposed in §264.20(a) are not very representative of the types of contaminants which can be expected to discharge from hazardous land disposal facilities. One commenter on the 18 December 1978 proposed regulations made this point in criticizing the "ground-water endangerment standard". The Agency agrees with the commenter's point, and proposes the minimum requirements of §264.20(a) not as sufficient standards, but as a minimum standards.

A major factor in the proposal to adopt minimum standards within the hazardous waste land disposal regulations for sources of drinking water sources is the applicability of the standards. The standards are not restricted to application to the water supplied to a consumer on public drinking water systems as are most of the standards which are promulgated under the Safe Drinking Water Act. As proposed the standards are applicable to sources of ground water which may be withdrawn for use as either public or private drinking water. Little or no treatment is normally applied to ground water withdrawn for private drinking water use; and often the quality of the source water is not monitored after the source is initially developed. Private sources of drinking water are

therefore much more susceptible to the adverse effects which could result from discharges originating in hazardous waste land disposal facilities, and it is likely that those effects could continue unnoticed unless they imparted a taste or odor to the water. The proposed regulations require that all ground water which is or may be used as a source of drinking water, public or private, be protected.

D. Regulatory Language

Section 264.20 is added to read as follows:

§264.20 Minimum standards applicable to a variance from the ground-water protection standard for ground water used for drinking.

Owners and operators of Class D and E land disposal facilities shall not;

(a) discharge contaminants which will cause the concentration of contaminants at any point of actual or potential collection or withdrawal of ground water for use as drinking water to exceed:

(1) 80% of the following maximum contaminant levels specified in the National Interim Primary Drinking Water Regulations:

Barium	1.	mg/l
Cadmium	0.01	mg/l
Chromium	0.05	mg/l
Lead	0.05	mg/l
Mercury	0.002	mg/l
Nitrate (as N)	10.	mg/l
Selenium	0.01	mg/l

(2) 40% of the following maximum contaminant levels specified in the National Secondary Drinking Water Regulations:

Chloride	250.	mg/l
Foaming agents	0.5	mg/l
Sulfate	250.	mg/l
Total Dissolved Solids (TDS)	500.	mg/l

(3) 20% of the following maximum contamination levels specified in the National Secondary Drinking Water Regulations:

Copper	1.	mg/l
Iron	0.3	mg/l
Manganese	0.05	mg/l
Zinc	5.0	mg/l

(4) A color of greater than 3 color units.

(5) An odor greater than 1 threshold odor number.

(6) A sodium concentration greater than 20 mg/l.

ISSUE: Minimum standards based on other reference sources - §264.20(b)

A. Proposed Regulations and Rational

N/A

B. Summary of Comments

Commenters on 18 December 1978 proposed regulations suggested that the Agency add numerical standards to the ground-water endangerment standard based on drinking water Water Quality Criteria published under §304 of the Clean Water Act, and that the coverage of standards should include chemicals listed in both the Water Quality Criteria publications and the chemicals listed with respect to Hazardous Substance Discharge (Notification) Limits under §311 of the Clean Water Act. One commenter suggested that EPA should include

a listing of known carcinogens, mutagens, and teratogens as part of the standard. Finally one commenter suggested that EPA abandon the "endangerment" approach, and adopt non-degradation as a basic program concept.

C. Discussion

As noted in Background Document No. 7, the Agency has concluded that it is not able, at this time, to exclusively use an approach based on "Specific (numerical) ambient health and environmental perforance standards" to assure adequate health and environmental protection. The requirements proposed in §264.20(b) are an exception to that conclusion but are limited to those contaminants for which the Agency concludes that a minimum requirement of "zero" is appropiate for application to owners and operators of Class D and E land disposal facilities as defined in §264.19(c), i.e., land disposal facilities which do or will discharge into a portion of an aquifer which is or will in the future be a source of public or private drinking water supply. This is the same as §264.20(a), however, the standards do apply apply directly to the discharge. Since the standard is "none" or "zero", dilution is not at issue. The standards reflect the intention of the agency that the listed contaminants not be discharged as a waste to ground waters that are used or may be used as drinking water. The standards should not be interpreted to infer that the contaminants should not be used due to the associated risk to human health or the environment. However, it is felt that the risk associated with intentional disposal in locations which may contaminate drinking water is an unnecessary risk that can be avoided with proper waste management.

The contaminants listed in §264.20(b) are all listed as hazardous wastes or as hazardous constituents (Appendix VIII) in Part 261. Many are also among the "129 Priority Pollutants" which the Agency has studied in conjunction with the "65 Toxic Pollutants" discussed in Background Document No. 7. Therefore, many of the contaminants were studied and reported on in the most recently amendment to the criteria for water quality published in accordance with §304(a)(1) of the Clean Water Act on 28 November 1980 at 45 FR 79318-370.

Acrylonitrile is listed in the proposed performance standard based on potential carcinogenic effects due to exposure through ingestion of contaminated drinking water (21).

Arsenic is listed in the proposed performance standard based on potential carcinogenic effects due to exposure through injestion of contaminated drinking water (22).

Benzene is listed in the proposed performance standard based on potential carcinogenic effects due to exposure through ingestion of contaminated drinking water (23).

Benzidine is listed in the proposed performance standard based on potential carcinogenic effects due to exposure through ingestion of contaminated drinking water (24).

Beryllium is listed in the proposed performance standard based on potential carcinogenic effects due to exposure through ingestion of contaminated drinking water (25).

Carbamate Insecticides are listed in the proposed perforance standard based on the high toxicity of Methomyl and 2-Methyl-2-(methylthio)propionaldehyde-O-(methylcarbonyl) oxime (Aldicarb).

These pesticides, which act as cholinesterase inhibitors, are listed in both the proposed standard and in Part 261. The National Academy of Sciences has reported on the health effects of the listed carbamate insecticides (26) and on the more moderate health effects of Carbaryl (27), an unlisted carbamate insecticide.

Chlorinated Hydrocarbon Insecticides are listed in the proposed performance standard as a group based on the health effects of the chemical pesticides listed in the group. The health effects of the individual chemicals are discussed below.

Aldrin is listed in the proposed performance standard based on potential carcinogenic effects due to exposure through ingestion of contaminated drinking water (28).

Chlordane is listed in the proposed performance standard based on potential carcinogenic effects due to exposure through ingestion of contaminated drinking water (29).

DDT (Total - DDT,DDD,& DDE) is listed in the proposed performance standard based on potential carcinogenic effects due to exposure through ingestion of contaminated drinking water (30).

Dieldrin is listed in the proposed performance standard based on potential carcinogenic effects due to exposure through ingestion of contaminated drinking water (28).

Endrin and metabolites are listed in the proposed performance standard based on its high toxicity (31).

Heptachlor and Heptachlor epoxide (all isomers) is listed in the proposed performance standard based on potential carcinogenic effects due to exposure through ingestion of contaminated drinking water (32).

Kepone is listed in the proposed performance standard based on potential carcinogenic effects due to exposure through ingestion of contaminated drinking water (33).

Lindane is listed in the proposed performance standard based on potential carcinogenic effects due to exposure through ingestion of contaminated drinking water (34).

Methoxychlor is listed in the proposed performance standard based on its high toxicity (35).

Toxaphene is listed in the proposed performance standard based on potential carcinogenic effects due to exposure through ingestion of contaminated drinking water (36).

Chloroethene is listed in the proposed performance standard based on potential carcinogenic effects due to exposure through ingestion of contaminated drinking water (37).

Chloroform is listed in the proposed performance standard based on potential carcinogenic effects due to exposure through ingestion of contaminated drinking water (38).

Chlorophenoxy Herbicides are listed in the proposed performance standard as a group based on the health effects of the chemical pesticides listed in the group. The health effects of the individual chemicals vary significantly. The toxicity of 2,4-Dichlorophenoxy-acetic acid (2,4-D) and 2-Methyl-4-chlorophenoxypropionic acid is considered moderate. The toxicity of 2,3,7,8-Tetrachlorodibenzo-p-dioxin is extremely high; and "dioxin" is often present in commercial grades of 2,4,5-Trichlorophenoxyacetic acid and 2,4,5-Trichlorophenoxypropionic acid (2,4,5-TP) as a contaminant introduced in the manufacturing process. The specific health effects

of this group of chemicals has been reported on by the National Academy of Sciences (39). Criteria for Water Quality proposed for 2,3,7,8-Tetrachlorodibenzo-p-dioxin on 15 March 1979 at 44 FR 15965 have not yet been published in final form.

Hexavalent Chromium was listed in the proposed performance standard based on potential carcinogenic effects due to exposure through ingestion of contaminated drinking water reported in the proposed Water Quality Criteria published on 1 October 1979 at 44 FR 56647. The Agency modified that proposal in the final criteria and now recommends a limit of 50 ug/l consistant with the existing Interim Primary Drinking Water Regulation limit for total chromium (40). This change in the Criteria for Water Quality was not noticed before the reproposed hazardous waste land disposal regulations were published. As a result of the change in the criteria, the listing of hexavalent chromium has been deleted from the regulatory language of §264.21(b).

3,3'-Dichlorbenzidine is listed in the proposed performance standard based on potential carcinogenic effects due to exposure through ingestion of contaminated drinking water (41).

1,2-Dichloroethane is listed in the proposed performance standard based on potential carcinogenic effects due to exposure through ingestion of contaminated drinking water (42).

Dichloroethylenes have been listed in the proposed performance standard as a group based on potential carcinogenic effects due to exposure through ingestion of contaminated drinking water. 1,1-Dichloroethylene has been shown to be carcinogenic. There is

insufficient data to draw positive conclusions on trans-1,2-Dichloroethylene however there does seem to be a presumptive basis for concern (43).

2,4-Dimethylphenol is listed in the proposed performance standard based on potential, but not conclusively demonstrated, carcinogenic effects due to exposure through ingestion of contaminated drinking water (44).

Dinitrotoluenes have been listed in the proposed performance standard as a group based on potential carcinogenic effects due to exposure through ingestion of contaminated drinking water. 2,4-Dinitrotoluene has been shown to be carcinogenic. There is insufficient data to draw conclusions concerning 2,6-Dinitrotoluene, but the chemicals often exist together in commercial grade products. The chemical, 2,3-Dinitrotoluene (which is not a listed hazardous waste) is more toxic than 2,4-Dinitrotoluene (45).

1,2-Diphenylhydrazine is listed in the proposed performance standard based on potential carcinogenic effects due to exposure through ingestion of contaminated drinking water (46).

Haloethers and Chloroalkyl Ethers have also been listed in the proposed performance standard as a group based on potential carcinogenic effects due to exposure through ingestion of contaminated drinking water. Some of the chemicals identified as being in these groups [Bis(chloromethyl)ether and Bis(2-chloroethyl)ether] have been shown to be, or are suspected [Bis(2-chloroisopropyl)ether] of being, carcinogenic. However, there is insufficient data to draw positive conclusions on many of the chemicals in an aqueous environment. Some of this lack of

data can be associated with the the very rapid physio-chemical reactions which some of the chemicals undergo (47,48,49).

Hexachlorobenzene is listed in the proposed performance standard based on potential carcinogenic effects due to exposure through ingestion of contaminated drinking water (50).

Hexachlorobutadiene is listed in the proposed performance standard based on potential carcinogenic effects due to exposure through ingestion of contaminated drinking water (51).

Hexachloroethane is listed in the proposed performance standard based on potential carcinogenic effects due to exposure through ingestion of contaminated drinking water (42).

Hydrogen sulfide was listed in the proposed performance standard due to an error in interpretation of notes wherein "none" (i.e., no standard) was read to mean "zero". It has been deleted from the regulatory language.

Nitrosamines have been listed in the proposed performance standard as a group based on potential carcinogenic effects due to exposure through ingestion of contaminated drinking water. Many of the chemicals identified in this group have been shown to be carcinogenic (52).

Polychlorinated biphenyls are listed in the proposed performance standard based on potential carcinogenic effects due to exposure through ingestion of contaminated drinking water (53).

Organophosphate Insecticides are listed in the proposed standard based on the high toxicity of the listed chemicals. These pesticides, which act as cholinesterase inhibitors, are listed in both the proposed standard and in Part 261. The National Academy

of Sciences has reported on the health effects of the listed insecticides and on the more moderate health effects of Guthion, Diazinon, and Malathion; unlisted insecticides in this group (54).

Pentachloronitrobenzene is listed in the proposed performance standard based on potential carcinogenic effects due to exposure through ingestion of contaminated drinking water (55).

Polynuclear Aromatic Hydrocarbons are listed in the proposed performance standard based on potential carcinogenic effects due to exposure through ingestion of contaminated drinking water (56). Two of the listed chemicals, Naphthalene (57) and Fluoranthene (58); and one of the chemicals which is not listed, Acenaphthene (59) have been studied to develop Criteria for Water Quality. Those chemicals and four others [Acenaphthylene, Fluorene, Anthracene, and Phenanthrene], which are not listed are among the "129 priority pollutants" studied by the Agency (50). All of the above mentioned chemicals have less than four aromatic rings. No polynuclear aromatic hydrocarbons with less than four rings has been shown to be carcinogenic. However, they are seldom differentiated and, therefore, they are treated as a group. Benz(a)anthracene and Benzo(c)phenanthrene have four rings and are known to be carcinogenic, whereas Crysene with four rings has not been shown to be carcinogenic. The other listed chemicals have greater than four rings. Those with five or six rings known to be the most potent include Benzo(b)fluoranthene, Benzo(j)fluoranthene, Benzo(a)pyrene, Dibenz[a,h]anthracene, Dibenzo[a,e]pyrene, Dibenzo[a,h]pyrene, and Dibenzo[a,i]pyrene (56).

1,1,2,2-Tetrachloroethane is listed in the proposed performance standard based on potential carcinogenic effects due to exposure through ingestion of contaminated drinking water (42).

Tetrachloroethene is listed in the proposed performance standard based on potential carcinogenic effects due to exposure through ingestion of contaminated drinking water (60).

Tetrachloromethane is listed in the proposed performance standard based on potential carcinogenic effects due to exposure through ingestion of contaminated drinking water (61).

1,1,2-Trichloroethane is listed in the proposed performance standard based on potential carcinogenic effects due to exposure through ingestion of contaminated drinking water (42).

Trichloroethene is listed in the proposed performance standard based on potential carcinogenic effects due to exposure through ingestion of contaminated drinking water (62).

D. Regulatory Language

(b) discharge any of the following contaminants or groups of contaminants to ground waters which are or which could in the future be collected or withdrawn for use as drinking water.

Acrylonitrile

Arsenic

Benzene

Benzidine

Beryllium

Carbamate Insecticides, including but not limited to;

Methomyl

2-Methyl-2-(methylthio)propionaldehyde-
O-(methylcarbamyl) oxime

Chlorinated Hydrocarbon Insecticides, including but not limited to;

Aldrin

Chlordane

DDT (Total - DDT,DDD,& DDE)

Dieldrin

Endrin and metabolites

Heptachlor and Heptachlor epoxide (all isomers)

Kepone

Lindane as

gamma-Hexachlorocyclohexane

Hexachlorocyclohexane and

Hexachlorocyclohexane (all isomers)

1,2,3,4,5,6-Hexachlorocyclohexane

Methoxychlor

Toxaphene

Chloroethene

Chloroform

Chlorophenoxy Herbicides, including but not limited to;

2,4-Dichlorophenoxyacetic acid (2,4-D)

2-Methyl-4-chlorophenoxypropionic acid

2,3,7,8-Tetrachlorodibenzo-p-dioxin

2,4,5-Trichlorophenoxyacetic acid

2,4,5-Trichlorophenoxypropionic acid (2,4,5-TP)

3,3'-Dichlorbenzidine

1,2-Dichloroethane

Dichloroethylenes, including but not limited to;

1,1-Dichloroethylene

trans-1,2-Dichloroethylene

2,4-Dimethylphenol

Dinitrotoluenes, including but not limited to;

2,4-Dinitrotoluene

2,6-Dinitrotoluene

1,2-Diphenylhydrazine

Haloethers and Chloroalkyl Ethers, including but not limited to;

Bis(chloromethyl)ether

Bis(2-chlorotheoxy) methane

Bis(2-chloroethyl)ether

Bis(2-chloroisopropyl)ether

4-Bromophenyl phenyl ether

2-Chloroethyl vinyl ether

Chloromethyl methyl ether

Hexachlorobenzene

Hexachlorobutadiene

Hexachloroethane

Nitrosamines, including but not limited to;

N-Nitrosodi-N-butylamine

N-nitrosodiethanolamine

N-Nitrosodiethylamine

N-Nitrosodimethylamine

N-Nitrosodiphenylamine

N-Nitrosodi-N-propylamine

N-Nitrosomethylethylamine

N-Nitrosomethylvinylamine

Polychlorinated biphenyls

Organophosphate Insecticides, including but not limited to;

0,0-Diethyl S-[2-(ethylthio)ethyl] phosphorodithioate (Disulfoton)

Methyl parathion

Parathion

Phorate

Pentachloronitrobenzene

Polynuclear Aromatic Hydrocarbons, including but not limited to;

Benz(c)acridine

Benz(a)anthracene

Benzo(b)fluoranthene

Benzo(j)fluoranthene

Benzo(a)pyrene

Crysene

Dibenz[a,h]acridine

Dibenz[a,j]acridine

Dibenz[a,h]anthracene

7H-Dibenzo[a,g]carbazole

Dibenzo[a,e]pyrene

Dibenzo[a,h]pyrene

Dibenzo[a,i]pyrene

Fluoranthene

Indeno[1,2,3-cd]pyrene

Naphthalene

1,1,2,2-Tetrachloroethane

Tetrachloroethene

Tetrachloromethane

1,1,2-Trichloroethane

Trichloroethene

4. Performance standards and associated demonstrations of performance - §264.21

ISSUE: When demonstrations are required

A. Proposed Regulation and Rationale

N/A

B. Summary of Comments

One comment, unrelated to the above issue heading, received on the 18 December 1978 proposed regulations (See Background Document No. 7) can be referenced and responded to here primarily since it is convenient. The commenter objected to the inference of authority delegated to the "permit writer" instead of the Regional Administrator by the use of that phrase in the preamble to the proposed regulations. Another commenter on those proposed regulations suggested that "permit writers" be required to justify the use of the HHES override and that an appeal provision be included to avoid arbitrary use.

Commenters on the 8 October 1980 notice expressed similar concerns suggesting that limits must be placed on the permit writer's ability to demand additional data and analysis, and questioning how the Agency will keep its approach from ballooning into a never-ending quest for zero-risk data.

C. Discussion

Some form of demonstration to show that a land disposal facility will protect human health and the environment is required of all permit applicants. The complexity of the demonstrations required vary markedly with the specific circumstances of location, waste, and waste handling or treatment applicable to each case.

The most simple demonstrations will apply when an existing facility with a fully developed leachate plume can meet the ground-water protection standard, and the facility complies with State programs under Title III of the Clean Water Act.

The more complex demonstrations are required when a variance from the ground-water protection standard is needed, and when the means to evaluate the risks associated with leachate discharge to surface waters have not been established within State programs under Title III of the Clean Water Act (i.e., State-Federal Water Quality Standards do not provide a basis to judge the acceptability of the contaminants in the leachate discharge to surface waters).

The procedural requirements of Part 124 referenced in the first paragraph of §264.21 specifically require the "Director" (i.e., the Regional Administrator) to set forth the "reasons why any requested variances or alternatives to required standards do or do not appear justified". Since the more complex (and uncertain) demonstration requirements are associated with variances, and since the Regional Administrator (the "permit issuing authority") is required, in accordance with existing final regulations, to spell out the reasons why a requested variance does or does not appear justified; a tendency towards arbitrariness will be subject

public and peer review. The provisions for administrative relief (e.g., appeal) are also promulgated as final regulations in Part 124.

The Agency staff tends to use the term "permit writer" to describe the individual who will incur the obligation, by virtue of his employment and assignment, of considering all of the factors relevant to a permit application. The use of the term has been avoided in the preamble discussion of the reproposed hazardous waste land disposal regulations. The term used is "permit issuing authority" which does not infer any delegation of authority to the "permit writer".

D. Regulatory Language

Section 264.21 is added to read as follows:

§264.21 Performance standards and associated demonstrations of performance.

The demonstrations of performance required in paragraphs (a), (b), (c), and (d) of this section shall be considered in preparing the draft permit required by §124.6 and in preparing the statement of basis required by §124.7, and summarized in accordance with §§124.8(b)(4) and (5) in the fact sheet required by §124.8.

ISSUE: Affected aquifer to be described - §264.21(a)(1)

A. Proposed Regulation and Rationale

N/A

B. Summary of Comments

Few of the comments received on the 8 October 1980 notice can be correlated directly with this provision. Commenters did refer to the cost of hydrologic and geologic investigation, but primarily with reference to the lack of assurance that a permit would be issued

after the expense had been incurred or with reference to situations where the discharge would result in only trace or insignificant contamination entering an aquifer.

C. Discussion

Certainly the cost of geologic and hydrologic investigation is a significant cost associated with the regulations and that cost is in part due to the need to know where contaminants discharged from a land disposal facility will migrate. Such cost will be highly variable depending on the site specific geology and hydrology, and could become very high in some locations with naturally complex geology. However, the agency feels there is an absolute need to know where effects resulting from hazardous waste land disposal facilities can be expected to occur. At least for new facilities, a permit applicant has some measure of choice with respect to facility location, and can choose (hopefully with some knowledge or professional assistance) to locate where the natural geologic system is homogenous and relatively simple to define. If an applicant chooses a site location with complex geology, that choice will also be a choice to expend greater resources.

The Agency does not expect the regulations to be interpreted to require investigations beyond the point of reasonable concern. The real issue raised by the comment concerning trace or insignificant amounts is - what is a trace or insignificant amount? Since the regulations do not establish numerical standards for all contaminants that might be present in ground water due to discharges from land disposal facilities, that is a question that the regulations do not address quantitatively except with respect to wastes containing

particular constituents listed in §264.20 when the discharge will migrate to actual or potential sources of drinking water. Therefore the issue will have to be considered on a case by case basis in the permit issuance process.

The obligation to define aquifers which will be affected by discharge may be simplified by reference to available public sources of information. See Background Document No. 6 with respect to site investigation reguirements.

As discussed elsewhere, the ground-water protection standard is primarily a locational standard in that compliance with the standard is based on a showing that ground water affected by discharges from hazardous waste land disposal facilties is not and will not in the future be collected or withdrawn for any use. The performance standard established in §264.21(a)(1) is a simple statement to the effect that discharge into or within aquifers not described by the permit applicant as receiving discharge will not be authorized by a permit. Therefore, the minimum level of knowledge required to pursue a permit for a land disposal facility under Part 264 is that knowledge needed to define, within some outside bounds, where a discharge will migrate within the land. The land and ground water within these outside limits are defined as the "zone of containment" and are to be established for each discharge through the filing of information in compliance with paragraphs (3)(v) and (4)(iv) of §122.25(d) - See Background Document No. 6.

D. Regulatory Language

(a) The owner or operator of a land disposal facility shall not initiate or continue;

(1) Any discharge that will result in the migration of contaminants into any aquifer not described in the permit application as recieving discharge; or

ISSUE: Effects on surface waters - §264.21(a)(2)

A. Proposed Regulation and Rationale

N/A

B. Summary of Comments

Commenters on the 18 December 1978 proposed regulations specifically criticized the Agency for not integrating the ground water and surface water protection requirements.

A number of the comments on the 8 October 1980 notice expressing concern with respect to the demonstrations required when a variance is needed can be interpreted to apply to §264.21(a)(2). However, consideration of those comments will be deferred to the discussion under the issue heading "Need for a variance" since the regulatory language of §§264.21(c) and (d) covered under that issue heading are almost an exact parallel to paragraphs (vi) and (v) of §264.21(a)(2). The only real differences are the need to consider certain factors which are specifically surface water concerns included in paragraphs (v)(B) and (D) of §264.21(a)(2).

C. Discussion

The provisions of §264.21(a)(2) establish the demonstrations required to show compliance with paragraph (b) of the ground-water protection standard set forth in §264.2.

Once a discharge has exited a land disposal facility, it can be expected to migrate ultimately to surface waters. The time over which this migration will occur can vary markedly from zero time

for a facility constructed within a wetland or watercourse, to days weeks or months for a facility constructed in or over highly permeable soils adjacent to a water course, to tens or hundreds of years for a facility constructed in very tight soils (e.g. fine grained low permeability soil) distant from a surface water body, to thousands of years for a facility constructed in an arid climate in an area where there are no surface waters which are supported by ground water discharge and the ground water flows throught very deep formations toward very distant surface waters. Regardless of the length of time required for the migration of a leachate plume to surface waters, the basis for review of effects on surface waters resulting from the discharge of a migrating leachate plume are equivalent to the basis for review of discharge effects established under the Clean Water Act.

Paragraph (i) references applicable State-Federal Water Quality Standards; and the criteria that apply under §302 of the Clean Water Act when it has been determined, for a particular surface water body, that effluent limitations under §301 will not attain or maintain acceptable water quality. A permit applicant would be required to show that the discharge of leachate mixed with ground water would not violate Water Quality Standards or, when §302 had been exercised with respect to point source discharges to the surface water body, that the discharge would not interfere with the attainment or maintence of water quality.

Paragraph (ii) provides that the facility must be consistant with applicable Areawide or Statewide Waste Treatment Management Plans. These Clean Water Act planning documents often address

issues such as leachate discharge and ground-water protection.

Paragraph (iii) establishes those circumstances when a variance is required with respect to surface water effects. A variance is required only when criteria for water quality have not been published by the Agency with respect to the contamininants of concern; and then only when those contaminants will reach a point of actual or potential withdrawal for use. It should be noticed that this paragraph merely establishes the circumstances when a variance is required. It does not presume how the the contaminants of concern would be considered within the framework of the applicable State/ Federal Water Quality Standards. Some States have adopted numerical limits for contaminants which have not been considered of sufficient national importance to cause the Agency to undertake study and publish specific criteria. States may also have adopted narrative standards which are the basis for considering certain types of contaminants for which numerical limits have not been established. This situation could also exist with respect to contaminants for which the Agency has published criteria for water quality or the limits established may even not be consistant with the published criteria. In any event, since State/Federal Water Quality Standard are approved by the Administrator, such standards may establish the means of consideration by both the State and the EPA. Therefore, it may well be that provisions exist within approved State/Federal Water Quality Standards to control the contaminants of concern even in the absence of published criteria; or the situation may exist where the Standards are mute in the absence of published criteria. In either case, the the provisions of paragraphs (vi)

and (v) would apply, although it would seem reasonable to assume that when State/Federal Water Quality Standards did apply, the Regional Administrator might make the finding required by paragraph (iii)(B) with a limited showing by the owner or operator under paragraphs (iv) and (v).

In developing Criteria for Water Quality, the Agency has in the past considered and published criteria based primarily on data of observed acute lethal effects using multipliers to establish criteria applicable to chronic effects of exposure, or to exposure resulting from bioaccumulative properties of the contaminant or from other significant long-term effect characteristics. The criteria were established with the intention of providing protection to aquatic life living in the contaminated water, and to humans and to animal species that ingested the contaminated water. A limited amount of data has been published on phytotoxic effects to other than aquatic plants; most prior to the publication of the "red book" in 1976. In the 28 November 1980 publication of criteria, the Agency reported on the review of data on both acute and chronic effects, and on the risks associated with both the ingestion of contaminated water and the ingestion of aquatic organisms exposed to the contaminated water. Much of the data can be applied directly to ground water. This application of published criteria for water quality will be discussed under the issue heading "Need of a variance" which follows in this document.

As noted in the "Summary of Comments", paragraphs (vi) and (v) of §264.21(a)(2) are almost an exact parallel to the regulatory language of §264.21(c) and (d). The issues requiring discussion

with respect to this regulatory language will be covered under the issue heading "Need for a variance". Paragraph (v)(B) does not have a parallel in §264.21(d), but the factors to be considered are the equivalent of factors considered in paragraph (v)(A) except that the factors are with reference to surface water bodies rather than ground water. Paragraph (v)(D) is an exact parallel to the language of §264.21(d)(3) except that the additional factor of eutrophic effects must be considered.

D. Regulatory Language

(a) The owner or operator of a land disposal facility shall not initiate or continue;

(2) Any discharge that will enter any aquifer(s) described in the permit application as recieving discharge and result in migration of contaminants from the containment zone into surface waters; and

(i) Result in a violation of applicable Water Quality Standards approved or established by the Administrator or interfere with the attainment or maintenance of water quality in any portion of the navigable waters for which the Administrator has established or caused to be established water quality related effluent limitations; or

(ii) Be inconsistent with any Areawide or Statewide Waste Treatment Management Plans prepared in accordance with §§303e or 208 of the Clean Water Act and approved by the Administrator, or

(iii) Result in contaminants for which the Administrator has not developed and published criteria for water quality in accordance with §304(a) of the Clean Water Act:

(A) Reaching any present or potential source of water withdrawal from surface waters for domestic, agricultural, industrial, commercial or other uses; unless

(B) A variance is authorized in accordance with the procedures of Subpart A of Part 124 based on a showing by the owner or operator as required paragraphs (a)(2)(iv) and (v) of this section and a finding by the Regional Administrator that any surface water which is being or may in the future be withdrawn for domestic, agricultural, industrial, commercial or other uses, will not be adversely affected for such uses and that public health and the environment will not be adversly affected.

(iv) The owner or operator of a land disposal facility requiring a variance in accordance with paragraph (a)(2)(iii)(B) of this section must demonstrate that there is a social and economic need for the facility, and that there are no practical options for waste reduction including resource recovery, treatment prior to disposal, and waste segregation which could reduce or eliminate the need to dispose of the waste into or on the land.

(v) The owner or operator of a land disposal facility requiring a variance in accordance with paragraph (a)(2)(iii)(B) of this section must further demonstrate that the effects to be caused by discharge(s) will not adversely effect public health and the environment by detailed predictions of the generation, transport, and fate of individual contaminants in the leachate discharging to surface waters, and by detailed assessments of the risk of exposure to such individual contaminants taking into account;

(A) transport, dispersion, and fate of individual contaminants in ground water with respect to; solubility in ground water, exchange with the soil or rock, attenuation by the soil or rock, degradation of the contaminants, dilution by ground water, persistance of the contaminants, accumulation of the contaminants in soil or rock, miscibility in ground water, volatility from ground water, and the viscosity, specific gravity, and surface tension of the contaminants or contaminant solutions.

(B) transport, dispersion, and fate of individual contaminants in surface waters with respect to; solubility in surface waters, degradation of the contaminants, dilution by surface waters, persistance of the contaminants, accumulation of the contaminants in detritus and benthic deposits, and volatility from surface waters.

(C) the exposure level to individual contaminants with respect to; concentration, duration, and variability.

(D) the effects of exposure to individual contaminants on humans, animals, and plants based on reputable scientific studies which have been subject to challenging scientific review with respect to; cronic or acute toxicity, bioaccumulation, carcinogenesis, mutagenesis, teratogenesis, and eutrophication.

ISSUE: Effects on the atmosphere - §264.21(a)(3)

A. Proposed Regulation and Rationale

N/A

B. Summary of Comments

N/A

C. Discussion

The provisions of §264.21(a)(3) establish a basis for the review of a facility with reference to air impact. The basis for conclusions are broad, i.e., emissions must not adversely effect public health or the environment. The basis for analysis in paragraphs (i) and (ii) however narrow the concerns by limiting the required demonstrations with respect to ambient air quality issues to areas outside of the facility and by dealing specifically with the location of gaseous emissions as a means of regulatory control. If, based on the informational requirements of §122.25(d), the locations of gaseous emissions have been defined and and will be limited by the permit, the performance requirement is satisfied except with respect to downwind ambient air impact. As a function an issued permit, the air emission monitoring and evaluation requirements discussed in Background Document No. 8 require air emissions and downwind ambient air quality to be monitored and verified to be within the limits established in the permit.

D. Regulatory Language

(a) The owner or operator of a land disposal facility shall not initiate or continue;

(3) To place in the facility any volatile wastes that will migrate and be emitted into the air unless it can be demonstrated that volatile contaminants will not adversely effect public health or the environment:

(i) Because the emissions will not cause substantial present or potential hazard to public health and the environment outside of the facility or migrate into structures occupied by persons; and

(ii) Because access to the land area where gases will escape will be controlled during the active life of the facility, during the closure and the post-closure care periods, and following the post-closure care period if gaseous escape will continue to occur.

ISSUE: Effects on structures - §264.21(a)(4)

A. Proposed Regulation and Rationale

N/A

B. Summary of Comments

N/A

C. Discussion

The provisions of §264.21(a)(4) establish the performance requirements with respect to leachate effects on structures. The issues of concern in this paragraph are adverse physical effects to the structures themselves. Gaseous effects on the occupants of structures are covered by §264.21(a)(3). Where leachate contacts a structure, either directly because the structure is constructed below the water table or indirectly due to the capillarity of the waste in contact with the soil which may cause the waste to contact structures above the water table, a number of potential problems must be considered. Acid conditions may tend to breakdown the physical integrity of concrete structures or metals, and solvent type waste materials may damage waterproofing applied to protect structures. The issues of concern will have to be considered on a case by case basis and will depend on the chemical characteristics of the particular discharge or leachate. The performance standard, in effect, also allows a simple showing of no expected adverse effects if the structures which exist or may be constructed will

not be contacted by discharge or leachate. Avoidance of contact between leachate or discharge and structures not associated with the waste management systems would be a normal design objective for land disposal facilities.

D. Regulatory Language

(a) The owner or operator of a land disposal facility shall not initiate or continue;

(4) Any discharge to ground water that will adversely effect any structures which exist or may be constructed in or above any aquifer described as receiving discharge.

ISSUE: Control over ground water use - §264.21(b)

A. Proposed Regulation and Rationale

N/A

B. Summary of Comments

See Background Document No. 7 - Ground-Water Protection Standard

C. Discussion

Many commenters on the 18 December 1978 proposed regualtions focused on the desirablity of applying regulatory standards for hazardous waste land disposal facilities with specific regard for the uses of the ground water which would be affected by discharges from the facilities; and in the 8 October 1980 Supplemental Notice of Proposed Rulemaking, the Agency announced its intention to consider the use of the affected ground waters as a major factor in the development of the regulations. Commenters on the 8 October 1980 notice did express a variety of opinions on the adoption of standards which took into account the use of the affected ground water. Most of the commenters, however, focused on the potentially difficult

task of showing that a discharge would not cause an adverse effect when the discharge would migrate to points of use. That subject is not at issue in this section. This section of the background document is focused on that part of the reproposed regulations that is intended to ensure that a discharge which will not migrate to a point of active ground water use will not in the future violate the ground-water protection standard.

A number of commenters did focus on the means by which use, especially future use, would be controlled. Their comments are summarized among those under the heading "Non-Degradation" and the sub-heading "General Non-degradation Strategy" under the issue heading "Nonnumerical health and environmental standard (Ground-water protection standard)" in Background Document No. 7. A number of the commenters discussed the intended approach with respect to the Agency's effort to establish a "Ground Water Protection Strategy". This effort is discussed under a separate issue heading in Background Document No. 7.

As discussed in Background Document No. 7, the Agency does expect that, if the proposed Strategy were to be followed, and State classifications of ground-water uses are established, such State use designations might be recognized in the permitting process. The process by which it is proposed that the Strategy be implemented is a phased approach in which full implementation is not anticipated for about a decade. Clearly the implementation of the hazardous waste land disposal permitiing program cannot await implementation of the Strategy.

The definition and designation of ground water aquifers with respect to use is a resource intensive task when viewed with either a nationwide or statewide perspective. There are, however, many locations where adequate information exists now due to existing uses for water supply, positive knowledge about the lack of uses, and even locations where the opportunity to designate the future uses of ground water have been foreclosed by the actual uses being made of the ground water or the land which affect ground water quality and limit the possible uses to which the ground water can be put. This latter situation is especially true with respect to surficial (uppermost) aquifers.

Urban uses of land greatly increase the potential of adverse effects to ground water due to fuel, oil, and chemical storage, transportation, and use. Spillage and disposal is almost an inherent result of such land use, especially in industrialized areas. Similar effects occur in areas that are mined to extract raw materials to support our urban society, or are subject to intensive agricultural uses to produce food products. The disposal of "solid wastes", which include liquid wastes by RCRA definition, in land disposal facilities has affected ground water quality not only in urban industrial areas but also in many remote areas, removed from areas of intensive land use, to which such activity was relegated by the "out of sight - out of mind" process of site selection.

In many of these areas where land use and waste disposal have resulted in adversely affected ground water, the effects cannot practically be reversed, and the ground water is not presently available for uses which require high quality water. This fact may

or may not be recognized depending on whether or not attempts have been made to measure such effects or to withdraw and use the ground water. The monitoring of ground water in the vicinity of active hazardous waste disposal sites operating under interim status will reveal this situation in a very direct way, and decisions will have to be made on allowing such facilities to continue to operate or to cause them to close down. Unless the impared quality of the ground water can in fact be reversed, causing them to close will serve no usefull purpose in protecting human health. The only rational means of protecting human health from the adverse effects which could result from the use of irreversibly contaminated ground water, is to restrict those uses which would be adversly effected.

This needed control over the use of affected ground water is a reality that must be faced in the administration of the RCRA programs for both non-hazardous and hazardous waste land disposal. It is also a reality that must be faced in any scheme of ground water use classification that may ultimately evolve from the implementation of a national ground-water protection strategy. Furthur, it must be recognized that future land use and waste disposal decisions will also result in the contamination of ground water for some uses. With respect to hazardous waste land disposal, decisions which recognize that some ground waters will be adversely affected for some uses by the locating of new hazardous waste land disposal facilities must be made consciously. The objective established by paragraph (a) of the ground-water protection standard in §264.2 of the reproposed regulations is the relagate hazardous waste land disposal to locations where the affected ground water is not and will not be used.

The available locations for hazardous waste land disposal facilities which will comply with paragraph (a) of the ground-water protection standard are those locations where the discharge or leachate from the facility will not migrate to points of ground water use. Therefore, the means by which it can be established that affected ground water is not and will not be used is a very important element of the regulatory scheme. Since it is considered a practical reality that hazardous waste land disposal will result in discharge that can be expected the reach and affect ground water (except in very unique locations); the primary means available is to show that use will not occur.

Before ground water may be collected or withdrawn for use, the party who desires to collect or withdraw it for use must have the legal right to do so. If that right is controlled or withheld so that the legal right to collect or withdraw ground water is not available, use cannot occur. Paragraphs (1) and (2) of §264.21(b) establishes that the control of ground water rights can be recognized in the permit issuance process. Therefore, if an applicant, once he has shown where his discharge or the leachate from his facility is migrating or will migrate by filing the information required in §122.25(d), can show that the ground water which will be affected cannot legally be collected or withdrawn for use; he will have demonstrated compliance with paragraph (a) of the ground-water protection standard in §264.2. This may be achieved by showing that the control over the collection or withdrawal which has been exercised by a duly authorized government entity, or by any private party who controls those rights will preclude access and use.

The means by which decisions to preclude the future collection or withdrawal of ground water for use are made would not be at issue in the permit issuance process. The ground water control issues relevant to the permit issuance process will therefore be limited to issues of fact. The Agency could otherwise be involved in those decisions through a variety of mechanisms such as the financing, review, and approval of State Solid Waste Management Plans under §4007(a) of the RCRA, Statewide Waste Treatment Management Plans under §303(e) of the Clean Water Act, or Areawide Waste Treatment Management Plans under §208 of the Clean Water Act. In some cases, of course, the Federal Government will have to be involved in such decisions since it will be the government entity (e.g., the owner of the rights) with the authority to control ground water collection or withdrawal.

In many, if not most, cases it is expected that these decisions to control future ground water collection or withdrawal will be actions which only confirm that the ground water which could be collected or withdrawn is not usable. As noted previously, this is the physical situation due to contamination in the vicinity of many existing municipal and private land disposal facilities, at many industrial site locations, and may be a situation which exists in other areas which have developed as urban areas or which have been used to mine raw materials from the earth. Government entities which have the authority should have an interest in protecting the public from using ground water which might adversely affect human health; and private parties, expecially those who may have caused or otherwise be aware of and may be held liable for the contamination

or resulting damages, should have the same interest. There is a competing interest however since restrictions on ground water collection or withdrawal would be an encumbrance on the land and affect its value. This could reduce property tax income based on value for government entities, and reduce the income which could be realized by the sale of the land by private parties.

Of greater potential future worth would be those land use and ground water use decisions which resulted from a recognition that land disposal facilities are a social need and that there are specific types of locations with favorable geological and hydrologic characteristics that are superior locations for such facilties. The identification of such locations is presently the subject of a great deal of professional attention by those in government and in the professional consulting fields of geology and hydrology. However, it is still a fact that the socio-political considerations remain a dominant force in the process of site selection and that the process has not matured sufficiently to realize the trust of the public.

Although the regulations stress control over ground-water collection or withdrawal for use as the appropiate means of achieving compliance with paragraph (a) of the ground water protection standard of §264.2; an owner or operator may otherwise document that the ground-water affected by discharge cannot be used as provided in paragraph (3) of §264.21(b). The means of demonstration are not defined in the regulatory language. This provision should allow some flexibility in the decision process which would allow the Agency to recognize demonstrations of a type it has not considered in the regulations.

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Among the types of demonstrations which have been considered are those which would show that the natural quality of the ground water preclude some uses, including drinking water use. There are also cases where the depth of the ground-water table makes it economically or technically impractical to withdraw the ground water. The Underground Injection Control (UIC) program recognizes these types of circumstances as a basis for determining an aquifer to be an "exempted aquifer", i.e., not to be protected as a source of drinking water in accordance with §146.04 (erronously identified as §146.03 in the regulations and corrected in the regulatory language below). Priority uses of aquifers (from which ground water could be withdrawn for drinking water use) to obtain raw materials, fuel, or energy are also recognized [in §146.04(b)(1)], as are certain techniques of raw material extraction [in §146.04(b)(4)], which can result in the contamination of ground water. Finally, ground-water aquifers which have become contaminated and which cannot be practically recovered for drinking water use may also be exempted under the UIC program.

As noted in paragraph (4) of §264.21(b), aquifers which are determined to be 'exempted aquifers" solely on the basis that they are used for some purpose other than as a source of drinking water will not be considered a valid basis to permit the injection of hazardous wastes. This is due to the fact that hazardous waste injection could interfere with the priority uses which makes the ground water unusable as a drinking water source.

Paragraph (4) of §264.21(b) also provides that "well injection" of hazardous waste directly into ground water which meets the

definition of an "underground source of drinking water" in §146.03 will not be authorized by permit unless the injection is into an "exempted aquifer". The purpose of this provision in the regulation, as noted in the preamble at 46 FR 11139, is to parallel the ban on the direct injection of hazardous waste into an "underground source of drinking water" established in the UIC program as a final regulation in Part 146. See Background Document No. 5 under the issue heading "Permits by rule" for additional discussion concerning this ban on direct injection.

Two problems were noted with respect to the manner in which paragraph (4) was written into the regulation after it was printed. The first is that the definition of an "underground source of drinking water" in §146.03 excludes "exempted aquifers" from the definition. The meaning of the regulation has been made clear by the substitution of the word "criteria" for the word "definition" and the addition of the phrase "paragraph (1) of the definition in" ahead of the reference to "§146.03" in the regulatory language below. The second is that the UIC ban on direct injection is not applicable only to Class A and B land disposal facilities since the defintion of an "underground source of drinking water" is not dependent of actual use. Therefore paragraph (4) has been recodified in the regulatory language below as paragraph (c), and paragraphs (c) and (d) recodified as paragraphs (d) and (e) respectively.

All of the amendments to the regulatory language discussed in the background documents have been submitted for publication in the Federal Register as corrections to the reproposed regulations.

D. Regulatory Language

(b) Owners and operators of Class A and B land disposal facilities shall not discharge to or otherwise affect ground water unless such ground water is not now and will not in the future be used as a source of water supply. The owner or operator shall document:

(1) That the authority to control ground water collection and withdrawal for use is vested with a duly authorized government entity which has exercised its authority to control ground water collection and withdrawal and use in favor of the type of use the owner or operator carries on or intends; or

(2) That privately held vested rights to control the collection and withdrawal and use of ground water from within the containment zone and any withdrawal and use of ground water which would cause the zone to expand have been exercised, or will be exercised prior to the initiation of discharge, to preclude continuing or future collection and withdrawal and use of ground water affected or to be affected by the discharge; or

(3) The owner or operator shall otherwise document that the ground water can not now and will not in the future be used.

(c) "Well injection" of hazardous waste directly into ground water which meets the criteria of an "underground source of drinking water" in paragraph (1) of the definition in §146.03 will not be authorized by permit unless the injection is into an "exempted aquifer". An aquifer or a portion thereof exempted solely due to the criteria of paragraphs (b)(1) or (b)(4) of §146.04 shall not be considered exempt for the purpose of hazardous waste injection.

ISSUE: Need for a variance - §264.21(c) & (d)

A. Proposed Regulation and Rationale

See the discussion under the issue heading "Nonnumerical human health and environmental standard (Ground-water protection standard)" in Background Document No. 7.

B. Summary of Comments

See Background Document No. 7.

C. Discussion

As noted in the preceding discussion, paragraphs (c) and (d) have been recodified as paragraphs (d) and (e) respectively. As noted in the discussion under the issue heading "Effects on surface waters", this discussion also covers the parallel provisions of paragraphs (iv) and (v) of §264.21(a)(2).

Under the reproposed regulations, when a variance is needed, the required demonstrations to show that the facility will comply with the standard of the Act, i.e., will not adversely effect human health or the environment, are more complex. This is due to the fact that the Agency has been unable to prescribe specific numerical standards by which the acceptability of discharges may be judged either as Criteria for Water Quality under §304(a)(1) of the Clean Water Act, or as water quality limits within the reproposed hazardous waste land disposal regulations.

Paragraph (c) - now (d) - of §264.21 and paragraph (iv) of §264.21(a)(2) both establish that when a variance is required, the permit applicant "must demonstrate that there is a social and economic need for the facility, and that there are no practical options for waste reduction including resource recovery, treatment

prior to disposal, and waste segregation which could reduce or eliminate the need to dispose of the waste into or on the land." As noted in the preamble at 46 FR 11138, the Agency believes that these issues are implicit in the permitting process and that they will be of particular relevance in the public participation aspects of that process. This requirement ensures that these issues will be addressed by owners and operators in a manner that allows adequate scrutiny by the public and the permit issuing authority.

The Agency furthur believes that the award of a permit is the award of a priviledge and that when the Agency has not been able to specify in the regulations precise criteria for the permitting decisions it must make, a broader range of issues are properly subject to consideration in the permit issuance process. It is not intended that these paragraphs of the regulation be read to infer that a decision to issue a permit will place the public whose water supply may be affected at risk, but only that the basis for the risk assessment has not been prescribed, except to the extent that the limited minimum requirements of §264.20 apply, and risk must be considered on a case by case basis.

The practical implications of these paragraphs are quite different for new versus existing facilities. Under almost all circumstances, the loss of an existing facility from the market place would represent a social and economic cost, and it is unlikely that even major alterations in the means by which waste was processed as a function of or prior to disposal would, in the near term, materially alter the effect of facility discharges via

the ground water on downgradient or downstream water use. However, for a new facility with the option of alternate site locations, only the absence of unused or unusable aquifers in the area where the need for the facility exists could, in most cases, be considered a sufficient reason for choosing to located where discharge will migrate to points of present or future ground water use.

Paragraph (d) - now (e) - of §264.21 and paragraph (v) of §264.21(a)(2) establish the substance of the risk assessment required when no Criteria for Water Quality for the contaminants of concern have been published under §304(a)(1) of the Clean Water Act or when no water quality limits for such contaminants have been promulgated within the hazardous waste land disposal regulations. The published Criteria for Water Quality have not been cited in conjunction with the need for a variance from paragraph (a) of the ground-water protection standard in §264.2 since the standard itself does not depend on numerical limits, however, the criteria are applicable to ground water quality decisions on a facility or area specific basis.

The section of the Clean Water Act which requires the Agency to periodically review and publish criteria for water quality also requires that the criteria accurately reflect the latest scientific knowledge:

(A) on the kind and extent of all identifiable effects on health and welfare including, but not limited to, plankton, fish, shellfish, wildlife, plant life, shorelines, beaches, esthetics, and recreation which may be expected from the presence of pollutants in any body of water, <u>including ground water</u>,

(B) on the concentration and dispersal of pollutants, or their byproducts, through biological, physical, and chemical processes, and

(C) on the effects of pollutants on biological community diversity, productivity, and stability, including information on the factors affecting rates of eutrophication and rates of organic and inorganic sedimentation for varying types of receiving waters.

This is a massive charge to the Agency, and the degree to which the task will be achieved with time is obvously dependent on both the availability of fiscal and personnel resources and on the availablity of valid "scientific knowledge".

As noted previously in this document, much of the data published by the Agency as Criteria for Water Quality can be applied directly to ground water, however one must consider whether it is appropiate at any given location to apply the data for exposure through ingestion of the contaminated water alone, or whether the exposure through aquatic organisms should be taken into account. Such exposure through aquatic organisms may be significant either because the leachate will effect such organisms upon discharge to surface waters, or because the exposure of aquatic organisms occurs due to direct surface discharges from the facility or from other sources. Exposure through aquatic organisms may even occur because they are a common food product imported into the area in which the exposure through ingestion of ground water is of real concern. Indeed, it may be appropiate to adjust the criteria applicable to any given geographic area due to exposure to contaminants of concern through natural background or through a variety of other exposure routes other than exposure through ingestion of affected drinking water.

Such factors as other routes of exposure, which are especially important to contaminants which cause cumulative effects, may or may not have been be consided in deriving the published criteria. Such factors are taken into account as part of the process of establishing surface water quality standards for specific reaches of streams or rivers, which in the case of facility specific ground water quality decisions, must be paralleled in the permit issuance process.

The narrative description of the analysis process on the fate and transport of individual contaminants parallels the scope of the informational requirements of §122.25(d) which are discussed in Background Document No. 6. The objective is to predict the maximum exposure levels to individual contaminants which would be authorized by an issued permit and be subject to monitoring (and if necessary modeling) verification and reprediction on a triannual basis. The degree of precision required in the predictions is specified in §122.25(e), is also discussed in Background Document No. 6.

Therefore, the unique requirements of these paragraphs covering risk assessment are with respect to the factors to be considered in judging "the effects of exposure to the individual contaminants on humans, animals, and plants based on reputable scientific studies which have been subject to challenging scientific review with respect to; cronic or acute toxicity, bioaccumulation, carcinogenesis, mutagenesis, and teratogenesis" in the absence of Agency published Criteria for Water Quality.

The means by which the Agency has considered available reference data to establish Criteria for Water Quality are described in the preamble to the 28 November 1980 publication of specific Water Quality Criteria at 45 FR 79319. Appendicies B and C to that Water Quality Criteria document are guidelines used by the Agency in the derivation of the criteria. The application of these guidelines to available valid scientific data on contaminants for which the Agency has not yet published criteria will allow the the derivation of comparable criteria for such contaminants. These guidelines may also be used to derive alternative criteria for application to specific locations for which the data used by the Agency to derive the published criteria is not the most appropiate data for that specific location; or to modify published criteria based on the availability of scientific data considered more valid than that used by the Agency to derive the published criteria.

Therefore, the essential task assigned to owners and operators of hazardous waste land disposal facilities by this portion of the regulations is equivalent to the task which must be undertaken by the Agency to derive and publish Criteria for Water Quality which may be applied to ground water. The means available to accomplish this task have been defined in conjunction with the Agency's publication of Criteria for Water Quality on 28 November 1980. It closely parallels the obligations assigned by the Congress through the Toxic Substances Act to those who manufacture, distribute in commerce, process, use, or dispose of chemical substances or mixtures.

An error in the printed regulation referencing §164.2 instead of §264.2 has been corrected in paragraph (c) - now (d) - below.

D. Regulatory Language

(d) Owners and operators of Class C,D, and E land disposal facilities (i.e., those requiring a variance under §264.2) must demonstrate that there is a social and economic need for the facility, and that there are no practical options for waste reduction including resource recovery, treatment prior to disposal, and waste segregation which could reduce or eliminate the need to dispose of the waste into or on the land.

(e) Owners and operators of Class C,D, and E land disposal facilities must further demonstrate that the effects to be caused by discharge(s) will not adversely affect public health and the environment by detailed predictions of the generation, transport, and fate of individual contaminants in the leachate and by detailed assessments of the risk of exposure to such individual contaminants taking into account;

(1) transport, dispersion, and fate of individual contaminants in ground water with respect to; solubility in ground water, exchange with the soil or rock, attenuation by the soil or rock, degradation of the contaminants, dilution by ground water, persistance of the contaminants, accumulation of the contaminants in soil or rock, miscibility in ground water, volatility from ground water, and the viscosity, specific gravity, and surface tension of the contaminants or contaminant solutions.

(2) the exposure level to individual contaminants with respect to; concentration, duration, and variability.

(3) the effects of exposure to individual contaminants on humans, animals, and plants based on reputable scientific studies

which have been subject to challenging scientific review with respect to; cronic or acute toxicity, bioaccumulation, carcinogenesis, mutagenesis, and teratogenesis.

III. NEED FOR REGULATION (Minimum Acceptable Treatment)

As noted in the introduction, the requirements proposed in Subpart T - Minimum Treatment of Hazardous Waste Prior to Disposal represent a minimum first generation of standards which are applicable to specific wastes or specific waste streams. The need for the regulation, or at least the concept which the subpart represents, has been demonstrated in large part by comments on the regulations proposed on 18 December 1978 and 8 October 1980 notice. Although the general tone of the comments can be expressed as a request for flexibilty, many commenters suggested particular types of requirements (often applicable primarily to a particular waste stream or a particular type of facility) which they felt would be appropiate or acceptable. Most of such requirements cannot be applied generically across the board to all land disposal facilities in general, or even to all land diposal facilities of a particular type, but may have particular application. It is the fullfillment of this need (or opportunity) for specificity to which this subpart is addressed.

There are types of wastes for which the agency expects to be able to promulgate requirements for disposal which will obligate the owners and operators of land disposal facilities to process the waste in a specific way (i.e., employ a known available technology or its equivalent in terms of performance) prior to disposal to minimize the risk of adverse human health or

environmental effects or to avoid the undesirable or unnecessary wasting of resources. It is expected that the particular standards which may ultimately be incorporated in this subpart will often be suggested by members of the regulated community based on their specialized experience and knowledge concerning the particular waste streams that they must deal with. A mechanism has even been provided within the regulations to allow such knowledge to be brought before the Agency for formal consideration on a site specific basis (See §260.23 and the preamble discussion of that section at 46 FR 11150-51).

It is with respect to the perceived need, reflected by the vast number of comments the Agency has received suggesting a "class of hazard system", to regulate on a waste specific basis that this subpart may in the future respond most specicically. The agency has not been able to subcategorize all hazardous wastes with respect to the degree of hazard they represent as many would have the Agency attempt to do. In part this is due to the fact that the same waste (or chemical) may represent varying levels of hazard depending on specific circumstances, and therefore the hazard representd by the waste (or chemical) is not independent of the means by which it is handled, or for that matter, the location at which handling occurs. Subpart T provides a location, within the regulation, where certian minimum requirements appropiate to the handling of a specific types of waste steams or chemicals prior to land disposal may be set forth. Therefore, the concept of this subpart is similar to a "class of hazard" system in effect, but the approach is to deal with definable specific wastes and waste streams as discrete units

rather than attempting to broadly categorize all listed wastes into subgroups.

The specific minimum requirements of the proposed regulations are, therefore, not fully representative of the future scope of this subpart envisioned by the agency. The minimum requirements which have been proposed are based on the need to regulate specific types of chemical wastes in landfills since the particular types of wastes are known to be highly mobil and/or capable of generating toxic gases. This mobility and the toxic gas generating properties represents a particularly high risk that adverse human health and environmental effects will result when they are landfilled; and the means to control those risks are known and available. Therefore the requlation identifies certain wastes which are known to exhibit high mobility or which can be expected to generate toxic gases in a landfill situation, and reguires that known available technology be applied to treat those specific wastes prior to disposal in a landfill.

IV. ANALYSIS OF STANDARDS (Minimum Acceptable Treatment)

A. Proposed Regulation and Rationale

N/A

B. Summary of Comments

N/A

C. Discussion

Under this subpart, requirements are established for the minimum acceptable treatment of hazardous waste prior to disposal in a land treatment facility. The purpose of these requirements is to reduce the potential adverse effects of hazardous waste

disposal by reducing the mobility of wastes, or their abiilty to cause other wastes to become mobile, or generate toxic gases.

Owners and operators of hazardous waste landfills are required under this subpart, by using available conventional technology, to convert soluble metals as salts to less soluble forms (i.e., oxides, hydrous oxides or sulfides) and to precipitate metals that are in solution. Wastes that are highly acidic or alkaline must be neutralized and wastes that are or contain surfactants or organic solvents must be disposed of separately from other wastes. Specifically, wastes that contain cyanide must be treated so that the cyanide is destroyed, thus reducing the risk that toxic hydrogen cyanide gas will be formed.

The requirements under this subpart, relating to mobility of wastes, address three general groups of mechanisms that may result in the enhancement of waste migration in soils. The first mechanism is one in which waste constituents are solubilized by other waste constituents and thereby increasing their potential for migration. Examples of this mechanism include the following:

° Solubilization reactions of metal species with inorganic acids and bases. In this reaction, a metal or insoluble metal species are converted to a more soluble form, usually a salt. The hazard potential of a toxic metal can therefore be increased due to solublilization via this mechanism. General categories of incompatible pairs under this mechanism include: (Hatayama, et. al. 1980)

a) metals - mineral acid

example: lead phosphate/hydrochloric acid

b) metals - oxidizing mineral acids

example: lead phosphate/nitric acid

c) metals - caustic

example: zinc cyanide/sodium hydroxide

° Solubilization reactions of metal species with organic acids and bases.

Organic acids and bases may also react with metals or insoluble metal species to form soluble products. General categories of incompatible pairs under this mechanism include:

a) metals - organic acids

example: lead phosphate/formic acid

b) metals - nitriles

example: lead phosphate/ethylene cyanohydrin

c) metals - amines

d) metals - amides

° Direct solubilization of metal containing compounds.

Some inorganics and organic-metallics may possess solubility characteristics that contribute to nonapparent mobilization. Some metal-containing compounds are insoluble or moderately soluble in water and highly soluble in organics, such as benzene.

Examples of incompatible metal-solvent pairs that may fall into this category are show below:

- phenylmercury acetate/benzene
- tetraethyl lead/benzene
- osmium tetraoxide/benzene
- zinc phosphide/benzene
- nickel carbonyl/benzene
- selenium sulfide/benzene

° Solubilization of organic compounds by organic solvents.

The solubilization of organic compounds can be divided into two categories. The first category (Group A) includes organic chemicals which on the basis of structure and experimental results, show solubility in both organic solvents (alcohol, ether, benzene) and water. The other category (Group B) consists of those organic chemicals that are not soluble in water, but are soluble in solvents (acetone) which themselves are soluble in water. These groups are listed in Table 1. For each category, the organic solvent serves as the carrier of the material to the saturated zone, and the solubility of either the organic compound or the "carrier" organic solvent in water, will tend to facilitate transfer of the organic compound to the ground water.

TABLE 1

Group A	Group B
1,1 dimethyl hydrazine acrolein	Parathion
Dimethylnitrosoamine aminoethylene	Endosulfan
Ethyl acetate	1,2 benzisothiazolin
Ethyl acrylate	Benz(a)anthracene
Ethylene oxide	Dibromochloromethane
Hydrazine	Cyclohexane
2-Naphthylamine	Chloroethane
2-Picoline	Chlorobenzilate
Pyridine	1,2 Dibromethane
1,3 Propylsultone	1,2 Dichlorobenzene
Tetrahydrofuran	Diepoxybutane
Acetonitrile	Acetophenone
Cyclohexanone	Toluene
Cyanogen	1,2 Dichloroethane
Potassium cyanide	o-Toluidine Hydrochloride
Barium cyanide	Malonitrile
Allyl Alcohol	Dimethylsulfate

The second mechanism is the disolution of metal salts by percolating water, while the third mechanism involves the chemical reactions among waste constituents which results in the generation of products which may be more mobile than the initial reactants. Examples of the third mechanism include the following:

° Reactions of metal species with other inorganics. An insoluble, or slightly soluble, metal salt may react with another inorganic to form a more soluble metal compound. Incompatible pairs may be exemplified by the reaction of lead oxide (slightly soluble) with potassium arsenate to form the more soluble plumabates or the formation of a soluble complex form the reaction of sodium chloride and lead oxide (Stone, et. al. 1975). These sets of reactions are very specific and may occur under a variety of conditions.

° Reactions between pesticides and caustics. Some pesticides have been known to form soluble salts with alkaline caustics. Examples of specific incompatible pairs in this group include: (Smith, et. al. 1975)

a) Guthion/sodium hydroxide
b) 2,4-D/sodium hydroxide
c) Demeton/sodium hydroxide

° Reactions between organic/inorganic acids and bases. Slightly soluble organic acids may react with inorganic/organic acids and bases to form more soluble components. An example of general incompatible pairs in this category would be: (Morrison & Boyd, 1973)

- phenols/NaOH
- aniline/HCl
- N,N dimethylaniline/acetic acid

D. Regulatory Language

Subpart T - Minimum Acceptable Treatment of Hazardous Waste Prior to Disposal

§264.490 Applicability.

The regulations of this subpart apply to owners or operators of facilities used for the land disposal of hazardous wastes, except as §264.1 provides otherwise.

§264.491 General requirements.

Except as otherwise provided in this section or in Part 266, owners or operators of facilities shall, at a minimum, use available technology to reduce the potential adverse effects of hazardous waste disposal by:

(a) Treating wastes prior to landfilling to reduce their mobility or their ability to cause other waste to become mobile, or ability to release toxic gas.

(1) Soluble metals as salts or salt solutions shall be converted to an oxide, hydrous oxide or sulfide.

(2) Using available technology to precipitate metals from from solutions in which they are solubilized due to complex formations or chelation.

(3) Wastes that are highly acidic or alkaline shall be neutralized.

(4) Wastes that are or contain surfactants, organic solvents or chelating agents shall be disposed separately from other wastes.

(5) Wastes containing cyanide salts or salt solutions shall be treated so that the cyanide is oxidized.

V. REFERENCES

Minimum Standards for Drinking Water - §264.20

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(2) Ibid; pages 59-62.

(3) Ibid; pages 63-64.

(4) Ibid; pages 69-75.

(5) Ibid; pages 76-80.

(6) Ibid; pages 81-83.

(7) Ibid; pages 113-117.

(8) U.S. Environmental Protection Agency; Statement of Basis and Purpose for the National Secondary Drinking Water Regulations; March 1977.

(9) Ibid; pages 3-7.

(10) Ibid; pages 15-19.

(11) Ibid; pages 42-47.

(12) Ibid; pages 48-50.

(13) Ibid; pages 11-13.

(14) Ibid; pages 25-28.

(15) Ibid; pages 29-33.

(16) Ibid; pages 51-53.

(17) Ibid; pages 8-10

(18) Ibid; pages 34-38.

(19) U.S. Environmental Protection Agency; National Primary Drinking Water Regualtions (Report); EPA-570/9-76-003; pages 120-125; September 1979.

(20) National Academy of Sciences; Drinking Water and Health; Chapter V; pages 218-230; 1977.

(21) U.S. Environmental Protection Agency; Ambient Water Quality Criteria for Acrylonitrile; EPA-440/5-80-017; October 1980.

(22) U.S. Environmental Protection Agency; Ambient Water Quality Criteria for Arsenic; EPA-440/5-80-021; October 1980.

(23) U.S. Environmental Protection Agency; Ambient Water Quality Criteria for Benzene; EPA-440/5-80-018; October 1980.

(24) U.S. Environmental Protection Agency; Ambient Water Quality Criteria for Benzidine; EPA-440/5-80-023; October 1980.

(25) U.S. Environmental Protection Agency; Ambient Water Quality Criteria for Beryllium; EPA-440/5-80-024; October 1980.

(26) National Academy of Sciences; Drinking Water and Health; Chapter VI; pages 165-172; 1977.

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(30) U.S. Environmental Protection Agency; Ambient Water Quality Criteria for DDT; EPA-440/5-80-038; October 1980.

(31) U.S. Environmental Protection Agency; Ambient Water Quality Criteria for Endrin; EPA-440/5-80-047; October 1980.

(32) U.S. Environmental Protection Agency; Ambient Water Quality Criteria for Heptachlor; EPA-440/5-80-052; October 1980.

(33) National Academy of Sciences; Drinking Water and Health; Chapter VI; pages 120-125; 1977.

(34) U.S. Environmental Protection Agency; Ambient Water Quality Criteria for Hexachlorocyclohexane; EPA-440/5-80-054; October 1980.

(35) National Academy of Sciences; Drinking Water and Health; Chapter VI; pages 106-110; 1977.

(36) U.S. Environmental Protection Agency; Ambient Water Quality Criteria for Toxaphene; EPA-440/5-80-076; October 1980.

(37) U.S. Environmental Protection Agency; Ambient Water Quality Criteria for Vinyl Chloride; EPA-440/5-80-078; October 1980.

(38) U.S. Environmental Protection Agency; Ambient Water Quality Criteria for Chloroform; EPA-440/5-80-033; October 1980.

(39) National Academy of Sciences; Drinking Water and Health; Chapter VI; pages 8-33; 1977.

(40) U.S. Environmental Protection Agency; Ambient Water Quality Criteria for Chromium; EPA-440/5-80-035; October 1980.

(41) U.S. Environmental Protection Agency; Ambient Water Quality Criteria for Dichlorobenzidine; EPA-440/5-80-040; October 1980.

(42) U.S. Environmental Protection Agency; Ambient Water Quality Criteria for Chlorinated Ethanes; EPA-440/5-80-029; October 1980.

(43) U.S. Environmental Protection Agency; Ambient Water Quality Criteria for Dichloroethylenes; EPA-440/5-80-041; October 1980.

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(46) U.S. Environmental Protection Agency; Ambient Water Quality Criteria for Diphenylhydrizine; EPA-440/5-80-062; October 1980.

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(52) U.S. Environmental Protection Agency; Ambient Water Quality Criteria for Nitrosoamines; EPA-440/5-80-064; October 1980.

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(61) U.S. Environmental Protection Agency; Ambient Water Quality Criteria for Carbon Tetrachloride; EPA-440/5-80-026; October 1980.

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